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about 5% to about 30% with respect to said semiconductor device. --

REMARKS

Reconsideration and allowance of this application, as amended, is respectfully requested.

This amendment is in response to the Office Action dated March 13, 2002.

By the present amendment, the original claims 1-19 have been cancelled, without prejudice, and replaced with new claims 20-35 for purposes of clarifying the invention. It is noted that, by virtue of the cancellation of claims 16 and 19, the objection to the drawings set forth in paragraph 3 and the 35 U.S.C. 112, first and second paragraph rejections set forth in paragraphs 6 and 7 of the Office Action have been obviated. Accordingly, removal of the objection to the drawings under 35 U.S.C. 112 rejections is respectfully requested.

Reconsideration and allowance of newly presented independent claim 20 and its dependent claims 21-28, 33 and 34 over the prior art cited to Shimoishizaka (USP 6,313,532) and Nakagawa (USP 4,983,023) is respectfully requested. Claim 20 has been redrafted to replace claim 4, rejected in the Office Action over the combination of Shimoishizaka and Nakagawa. As such, claim 20 specifically defines an arrangement of a semiconductor device having circuit electrodes aligned centrally of a semiconductor apparatus (an example of this can be shown in Fig. 27 with the circuit electrodes aligned centrally of the semiconductor apparatus). In conjunction with this, a first electrically insulating layer (e.g., 8) is formed on the semiconductor device with the circuit electrodes (e.g., 7) being exposed from the first insulating layer. A second electrical insulating layer (e.g., 5) is then formed on the first

insulating layer (shown, for example, in Fig. 28). External connection terminals (e.g., 3) are then formed on the second insulating layer, and a wiring (e.g., 4) is also formed on the second insulating layer to electrically connect the external connection terminal (3) to a circuit electrode of the semiconductor device. Finally, a third electrical insulating layer (e.g., 6) is formed on the second insulating layer and on the wiring. Further in accordance with claim 20, the second insulating layer (e.g., 5) contains particles. The nature of these particles is defined in more detail in dependent claims such as 22-26 which specify, for example, that the particles contained in the second insulating film control the shape of the second insulating film, (claim 22), that the particles can be made of the same material as the second insulating film (e.g., claim 23), or that the particles can be comprised of polyimide or of silicone (claim 24) etc.

In the Office Action, in paragraph 12 on page 7, it is noted that the primary reference to Shimoishizaka fails to disclose the claimed feature of an insulating film containing particles. However, the Office Action goes on to rely on a teaching of an insulating layer containing particles in Nakagawa. Therefore, the Office Action concludes that it would be obvious to combine Nakagawa with Shimoishizaka to arrive at the invention previously defined in claim 4.

Applicants respectfully submit that claim 20 and its dependent claims patentably defines over the combination of Shimoishizaka and Nakagawa. In the first place, it is noted that Shimoishizaka and Nakagawa relate to completely different structures. In particular, Shimoishizaka pertains to a semiconductor device whereas Nakagawa pertains to a liquid crystal display panel. For the reasons discussed below, it is respectfully submitted that this combination would not have been obvious to one of ordinary skill in the art, given the completely different nature of the

structures involved. Beyond this, as will be discussed below, the combination would lead to several problems, given the differences in structure of the respective devices.

In Nakagawa, a liquid crystal display panel is provided utilizing rigid particles 4 with polymer particles 5 in a liquid crystal material held and sealed in a space between two opposed plates. As such, the use of particles in liquid crystal material in Nakagawa relates to a technical field which is completely different than that of Shimoishizaka. It is respectfully submitted that it would never occur to one of ordinary skill in the art of Shimoishizaka to consider combining the particles from Nakagawa's liquid crystal material into an insulating layer in Shimoishizaka to provide an improved stress relaxation layer (as defined, for example, in claim 21).

More particularly, in Nakagawa, the particles are used for purposes of preventing the development of low-temperature bubbles and for controlling cell thickness in the liquid crystal material (e.g., see column 1, lines 42-44 of Nakagawa). This use of particles has absolutely nothing to do with utilizing particles in an insulating layer in a structure such as Shimoishizaka for stress relaxation purposes or, for that matter, anything else involving such an insulating layer. The bubble phenomena dealt with in Nakagawa has no relationship whatsoever to problems in structures such as constructed by Shimoishizaka. Therefore, it is respectfully submitted that the fact that Nakagawa pertains to a completely different technology with completely different problems having no pertinence to the structure of Shimoishizaka would go completely against one of ordinary skill in the art considering the combination of these references.

With regard to this, it is noted that the Board of Appeals Decision of Ex Parte Gerlach, 212 USPQ 471 requires that there must be some motivation in the prior art relied on for arriving at the claimed invention. It is respectfully submitted that, in the

present instance, such motivation is completely lacking from the cited prior art. Nakagawa deals with a set of problems with low temperature bubble phenomena in liquid crystal material which has nothing whatsoever to do with the Shimoishizaka device. Therefore, there is no motivation at all for one to look to Nakagawa for improving the Shimoishizaka device by providing, for example, an improved stress relaxation layer. Therefore, it is respectfully submitted that the combination of Shimoishizaka and Nakagawa in the manner proposed in the Office Action would be completely unobvious to one of ordinary skill in the art, and reconsideration and removal of the rejection on this basis is respectfully requested.

Beyond this, even if one were to somehow try to combine the significantly different structures of Shimoishizaka and Nakagawa, significant problems would be encountered. For example, how would one establish an appropriate viscoelasticity for the low elasticity layer 20 of Shimoishizaka to control the shape of the layer as defined in claim 22 (e.g., see the discussion in the specification beginning on page 60 regarding this). Also, how would one gradually change the thermo expansion coefficient and the elasticity of the low elasticity layer 20 of Shimoishizaka in a thickness direction to prevent undesirable disconnection of the wiring. There is no suggestion whatsoever in either Shimoishizaka or Nakagawa for dealing with such problems.

Beyond this, in Shimoishizaka, the low elasticity layer has inclined edge portions which are formed by first forming an insulating layer over the entire substrate and then forming an opening by means of photolithography or use of a laser (e.g., see Figs. 3a and 3b of Shimoishizaka). As such, Shimoishizaka never intended to form a low elasticity layer already provided with an opening so that it will have inclined edge portions when applied to the substrate. Therefore, there would

not be any advantage for Shimoishizaka to use particles in the low elasticity layer because the insulating layer, (without any opening) is formed first or coated, after which photolithograph is used to form an opening. In other words, if the insulating layer did have particles in Shimoishizaka, photolithography with the insulating layer would be unsatisfactory because the transmittance of the layer would be decreased and the shape of the inclined edge portions would not be controlled. The result would be that a fine wiring pattern could not be formed. Thus, if one did provide particles in the low elasticity layer 20 of Shimoishizaka, the intended objects of Shimoishizaka regarding this low elasticity layer would not be achieved.

As can be seen from the above discussion, the combination of Shimoishizaka and Nakagawa is not obvious in the first place, given the completely different nature of the structures involved. Beyond this, even if one were to somehow try to combine these references, numerous problems would be faced in the combination, and the end result would not be the claimed invention. Indeed, given the manufacturing steps taught by Shimoishizaka, the end result of such a combination would be a completely unsatisfactory device. Therefore, for these reasons, reconsideration and allowance of claim 20 and its dependent claims over the combination of Shimoishizaka and Nakagawa is respectfully requested.

Reconsideration and allowance of new independent claim 29 and its dependent claims 30-32 is also respectfully requested.

Claim 29 has been drafted to include features such as the first, second and third insulating layers discussed above for claim 20, in conjunction with the wiring formed on the second insulating layer for electrically connecting the external connection terminal to the circuit electrodes of the semiconductor device. However, rather than defining the particles discussed above for claim 20, claim 29 defines:

> "wherein said third insulating layer covers an upper surface and a side surface of said second insulating layer except where said external connection terminals and said wiring are connected to each other."

By virtue of this feature, invasion of foreign particles such as water which can cause peeling of the second insulating layer from the wafer or semiconductor device is prevented. In addition, ions which can cause degradation of the semiconductor characteristics are prevented from invading the device. The end result is a highly durable device. This is discussed, for example, on page 74, lines 4-21.

The primary reference to Shimoishizaka fails to teach or suggest a passivation layer covering an inclined edge portion of a wiring conductor. It appears that the structure shown in Fig. 1 of Shimoishizaka is of the device at an incomplete stage when it is still part of a semiconductor wafer. As such, the shape of the inclined edge portion, on which a wiring conductor is not formed, is not clear. In other words, it is not clear whether such an edge portion is inclined or perpendicular. Regarding this, if the edge portion is a perpendicular side surface, covering of such a side surface with a passivation film by means of photolithography is not possible. In any event, since Shimoishizaka simply shows the device at an incomplete stage at this point, there is certainly no teaching or suggestion of the claimed feature of the third insulating film covering the upper end side surface of the second insulating film except where the connection is made by the wiring.

Further, Shimoishizaka fails to teach or suggest any steps for preventing the possible invasion of foreign materials such as water or ions from the side surface of the low elasticity layer 20. Therefore, there is nothing in the reference to motivating one of ordinary skill in the art to provide such an arrangement.

Reconsideration and allowance of new independent claim 35, as well as dependent claims 30 and 34 is also respectfully requested. Independent claim 35

and dependent claims 30 and 34 all define the feature of the present invention that the second insulating layer, with the wiring formed, thereon:

> "has an inclined portion having a gradient of from about 5% to about 30% with respect to said semiconductor device."

This corresponds to inclination angles of 3 degrees and 17 degrees, respectively. A discussion of these features can be found on page 15, line 13 through page 16, line 10. As noted there, applicants have determined from their studies that providing the inclination angles with the gradients in this range permits providing desired thickness for the layer and avoids problems of step coverage which can lead to wire breakage.

On page 5 of the Office Action, it is noted that Shimoishizaka fails to teach an inclination in the claimed range. However, the Office Action goes on to state that it would be obvious to form an inclined portion of the first insulating layer 20 in such a range "since it has been held that where the general conditions of the claim are disclosed in the prior art, discovering the optimum or workable ranges involve only routine skill in the art." In Re Aller, 105 USPQ 233 is cited in support of this argument.

In response to this, applicants respectfully submit that a careful study of Shimoishizaka leads to the conclusion that the actual inclination angle in a structure manufactured in accordance with the teachings of Shimoishizaka would be about 70 degrees or more, far outside the claimed range. Specifically, in Shimoishizaka, photolithography is used for formation of the low elasticity layer 20. A photosensitive insulating material is coated and dried, and, afterwards, the dried insulating material is subjected to exposure and development to form an opening. As discussed in column 7, lines 19-41, scattered light is used for exposure of the wedge-shaped opening. As a result of this, applicants note that when photolithography is used in

this fashion to form an opening, the resulting inclination angle will be 70 degrees or more. Therefore, one following the teachings of Shimoishizaka would certainly not use gradients in the claimed range of 5% to 30%.

Since the Shimoishizaka reference fails to teach or suggest the claimed range, or even varying this parameter to try to find an optimum range, it is respectfully submitted that the use of the reference in the manner set forth in the Office Action amounts to an "obvious to try" rejection. Such a rationale goes directly against the teachings of In Re Antonie, 195 USPQ 6 (CCPA 1977):

> "the PTO and the minority appear to argue that it would always be obvious for one of ordinary skill in the art to try varying every parameter of a system in order to optimize the effectiveness of this system even if there is no evidence in the record that the prior art recognized that particular parameter affected the result. As we have said many times, obvious to try is not the standard of 35 U.S.C. 103...disregard for the unobviousness of the results of 'obvious to try' experiments disregards the 'invention as a whole' concept of Section 103...an over emphasis on the routine nature of the data gathering required to arrive at appellants' discovery after its existence became expected overlooks the last sentence of Section 103."

It is respectfully submitted that the teachings of In Re Antonie clearly apply in the present instance where there is no suggestion at all of varying the inclination to arrive at the claimed range in the cited reference.

Regarding the case of In Re Aller, 105 USPQ 233 cited on page 5 of the Office Action, the Court in In Re Antonie addressed this in stating:

> "In In Re Aller...the Court set out the rule that the discovery of an optimum value of a variable and known process is normally obvious. We have found exceptions to this rule in cases where the results of optimizing a variable, which was known to be a result effective, were unexpectedly good....this case, in which the parameter optimize was not recognized to be a result-effective variable, is another exception."

In other words, where the reference fails to recognize the significance of the optimized parameter, the holding of In Re Aller does not apply. It is respectfully submitted that this situation exists in the present instance since Shimoishizaka fails to recognize the significance of the parameter of the inclination gradient to avoid problems in the completed device. Accordingly, reconsideration and allowance of independent claim 35, as well as dependent claims 30 and 34 setting forth this feature is respectfully requested.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "Version with markings to show changes made."

If the Examiner believes that there are any other points which may be clarified or otherwise disposed of, either by telephone discussion or by personal interview, the Examiner is invited to contact applicants' undersigned attorney at the number indicated below.

To the extent necessary, the applicants petition for an extension of time under 37 CFR 1.136. Please charge any shortage in the fees due in connection with the filing of this paper, including extension of time fees, to the deposit account of Antonelli, Terry, Stout & Kraus, Deposit Account No. 01-2135 (500.39240X00).

Respectfully submitted,

ANTONELLI, TERRY, STOUT & KRAUS, LLP

By _____
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GEM/kd
703/312-6600

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Specification:

Page 74, paragraph beginning at line 4, has been amended as indicated below:

-- In the modified eighth step, a solder resist is applied onto the whole surface to form the surface protective film 6. Besides a spin coating method, a printing method using a mesh mask or a curtain coating method may be used as a method for applying the solder resist. To apply the solder resist, it is preferable that the wall surface of the dicing area of the stress relaxation layer 5 in the modified seventh step is not perpendicular to the wafer but V-shaped. This coating is performed after the stress relaxation layer is cut. Hence, invasion of foreign matters such as [ions] water, which may cause peeling-off of the stress relaxation layer 5 from the surface of the wafer 9 having semiconductors formed thereon and ions which may cause spoilage of semiconductors, can be reduced. Hence, a device with good durability etc. can be provided. --

In the Claims:

Claims 1-19 have been cancelled without prejudice.

New claims 20-35 have been added.